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COMPARATIVE STUDY OF PORTAL CIRCULATION TIME

IN PATIENTS WITH PORTAL HYPERTENSION

USSR -

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FOREWORD

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COMPARATIVE STUDY OF PORTAL CIRCULATION TIME
IN PATIENTS WITH PORTAL HYPERTENSION

- USSR -

Following is a translation of an article by Docent
A. R. Aliyev in the Russian-language journal
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Medical Journal), Baku, No. 6, 1960, pages 16-21.

One of the objective methods for a clinical diagnosis of portal hypertension is the determination of the different hemodynamic changes and, in particular, the determination of the rate (time) of portal circulation. These methods made it possible to judge the condition of the circulation under pathological conditions. The paucity of clinical data induced us to share some of our experience accumulated in studying hemodynamic changes in patients with portal hypertension.

Beginning in 1954 we directed our principal attention to determining the rate of portal blood flow in studying hemodynamic changes in patients with portal hypertension. At the beginning of our work we use for a test the forearm-to-lung and the rectum-to-lung (G. F. Neyman and I. B. Kogen, 1949) methods which are well known in Soviet and foreign literature. Using these methods we determined the portal circulation time in 44 patients.

As we know, the normal rate of blood flow, determined by different methods, allows large fluctuations from 12 to 26 seconds (A. L. Myasnikov, B. S. Shklyar, A. G. Ginetsinskiy, D. M. Abdullayev, A. V. Lebedinskiy, L. A. Leschinskiy and V. I. Ryabov, N. Benda, G. F. Neyman and I. B. Kogen, Sh. S. Val'dshteyn and B. T. Forzit).

For our investigations we selected a mixture consisting of 0.5 milliliter of ether and 4-5 milliliters of a physiological saline solution or a 0.5 milliliter solution of lobelin HCl. These mixtures or solutions were injected through the ulnar vein or the rectum. The portal circulation time was determined by taking into consideration the time which passed from the beginning of the injection to the appearance of the odor of ether in expired air, when ether was used, or until stronger deep breathing sets in when the lobeline test is being used.

In the table are given data on results from determining the rate of portal blood flow on the basis of the two methods described.

TABLE 1		
<u>Method</u>	<u>No. of Patients</u>	<u>Rate of portal flow in seconds</u>
Forearm-to-lung	4	36
"	8	40
"	10	45
"	8	47
"	4	50
"	10	65
Rectum-to-lung	2	32
"	2	36
"	5	44
"	6	61

For 15 of the 44 patients a simultaneous comparative study was made of the portal circulation time on the basis of the rectum-to-lung method as well. In all these cases of portal hypertension there was a marked retardation of portal circulation, and determination by the forearm-to-lung method always indicated a slowing down of 4-6 seconds greater than with the first method.

In our further work we somewhat modified our method for determining portal circulation time. Our impetus for this was the use in our clinic since 1954 of splenoportography as an X-ray method for diagnosing portal hypertension.

As we know, splenoportography makes it possible to obtain a contrast image of the entire intra- and extrahepatic portal vein system. The contrast medium, injected into the pulp of the spleen, fills the branches and the main trunk of the portal vein and, within a specific time (7-8 seconds), leaves the portal vein system. We aimed at studying the possibility of using this method for determining portal circulation time by injecting the above mentioned solutions directly into the spleen.

Simultaneous with the splenoportography we started injecting a mixture of ether (0.5 - 1.0 milliliter) with a physiological saline solution (4-5 milliliters) or 0.5 milliliter of a 1% solution of lobeline HCl into the spleen. We used this method on 51 patients. At the same time we studied the portal circulation time in some of these patients by the forearm-to-lung (5 patients) and the rectum-to-lung (6 patients) methods. In Table 2 we have data from these studies.

TABLE 2

<u>Method</u>	<u>No. of Patients</u>	<u>Portal circulation time in seconds</u>
Spleen-to-lung	8	40
"	4	44
"	9	46
"	23	50
"	5	56
"	2	66
Forearm-to-lung	1	54
"	3	60
"	1	70
Rectum-to-lung	3	48
"	2	54
"	1	64

Likewise of interest are the data which we obtained on the relation between the level of portal pressure and the portal circulation time. We examined a total of 95 persons, 52 of whom showed an intrahepatic block and 43 an extrahepatic portal block. Portal vein pressure was determined in the pulp of the spleen by means of a transdermal puncture.

TABLE 3

<u>Type of block</u>	<u>No. of Patients</u>	<u>Portal pressure in mm on an H₂O column</u>	<u>Portal circulation time in seconds</u>
Intrahepatic	17	400-450	56-66
"	35	350-400	47-50
Extrahepatic	24	275-300	36-44
"	19	300-350	45-46

As we see from Table 3, the greatest slowdown in portal circulation was observed in cases of intrahepatic portal block with a portal pressure level of between 400-450 millimeters on the H₂O column.

The technique of determining portal circulation time by the method which we propose is as follows: After preparing the skin at the puncture site and anesthetizing this area with a 0.5% novocaine solution we make a splenic puncture in the left infracostal region (in the case of a large spleen protruding

from the infracostal region) or in the 9th intercostal region along the central epigastric line (in the case of an unenlarged spleen). A mixture of ether and physiological saline solution or a lobeline solution is injected into the spleen with a syringe used to inject the contrast solution in splenoportography. After injecting these solutions we study the time of the appearance of the odor of ether in the expired air or the advent of labored deep breathing (when lobeline is used). This time, expressed in seconds, will be different, depending on the severity of the illness and the degree of impairment of the blood circulation.

We did not observe any macro- or microscopic changes in the spleen at the site of the injection of ether or lobeline.

In the literature we have recently seen descriptions of a number of other methods for determining portal circulation time. N. Benda (1954) determined the time of portal circulation by injecting ether into the duodenum through a duodenal probe. He believes a figure of 50 seconds to be normal. F. Lasch and D. Renner (cited by O. A. Leshchinskiy and V. I. Ryabov) propose for this purpose the injection of a solution of radioactive I^{131} rectally with subsequent control of the time of appearance of the tagged iodine in the thyroid gland.

I. B. Likhitsers and G. I. Nosenko used the peroral administration of radioactive sodium iodide and recorded the time of portal circulation on the basis of the appearance of this substance in the thyroid gland. On the basis of examining 8 healthy persons and 13 patients with cirrhosis the authors came to the conclusion that this method was unsuitable since iodine shows up later in the thyroid of healthy persons than in persons with cirrhosis. L. A. Leshchinskiy and V. I. Ryabov (1955), in studying the absorption capacity of the duodenum and the portal circulation time used a probe to inject into the duodenum a solution of potassium iodide, ether (1.5 milliliters) in a physiological solution (10 milliliters), radioactive isotopes of iodine (I^{131}) and phosphorus (P^{32}).

Table 4 presents data on portal circulation time determined by various methods for normal conditions and in portal hypertension.

In the literature available to us we did not find a description of the determination of portal circulation time by the spleen-to-lung method.

The method which we propose justifies itself in practice through its simplicity and availability. The method can be used simultaneously with splenoportography, does not require prolonged preparation and, in our opinion, is more accurate in determining circulation time in the portal vein system and, thus, serves as a method for diagnosing hypertension.

Table 4

Authors	Indicators	Forearm-lung Method		Oral method		Duodenal Method		Rectum-lung method		Spleen-lung Method	
		Normal	Portal Hyper- tension	Normal	Portal Hyper- tension	Normal	Portal Hyper- tension	Normal	Portal Hyper- tension	Normal	Portal Hyper- tension
Myasnikov, A.L. Shklyar, B.S. Ginetsinskiy, A.G. Abdullayev, D.M. Lebedinskiy, A.V.	Histamin, lobeline, Magnesium sulfide Calcium chloride	12-26 secs.	--	--	--	--	--	--	--	--	--
Neyman, G. F. Kogen, I.B. (1949)	Ether	--	--	--	--	--	--	11-25 secs	34-180 secs	--	--
Benda, N. (1954)	Ether	--	--	--	--	50 secs	Later 50 secs.	--	--	--	--
Leshchinskiy, L.A. Ryabov, V. I. (1957)	Ether	--	--	--	--	30-50 secs	70-150 secs	--	--	--	--
	Potassium iodide	--	--	--	--	3-5 mins.	7-8 mins.	--	--	--	--
	Radioiodine	--	--	--	--	5-7 mins.	Later 11 mins.	--	--	--	--
	Radiophosphorus	--	--	--	--	--	13.8 mins.	--	--	--	--
Lasch, F. Renner, D. (1957)	Radioiodine	--	--	--	--	--	--	--	Time not indicated	--	--
Likhitsker, I.B. Nosenko, G.I. (1957)	Radioactive sodium iodide	--	--	11	7 min. (?)	--	--	--	--	--	--
Aliyev, A. R. (1954)	Ether with a physiological solution Lobeline	--	30-50 secs.	--	--	--	--	--	32-36 secs.	36-66 secs.	--

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